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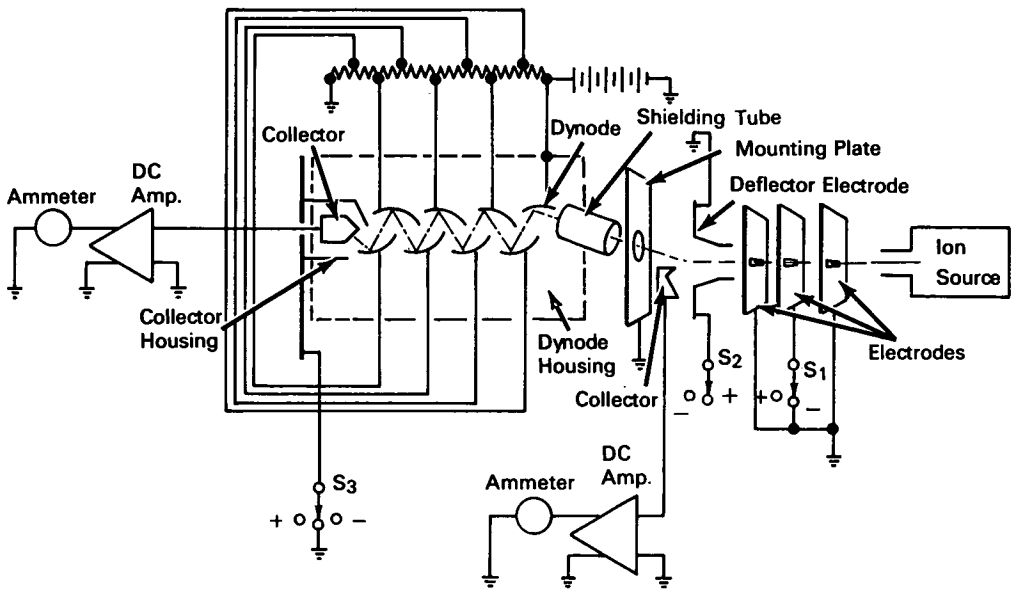
Brief 67-10060

NASA TECH BRIEF

Electron Multiplier Has Improved Performance and Stability



The problem:

To design an electron multiplier that is rugged in construction and capable of improved performance. The electron multiplier is used for the accurate detection and measurement of charged particles (ions) in evacuated systems such as high resolution mass spectrometers, leak detectors, and vacuum ultraviolet spectrographs. Prior constructions were easily damaged by mechanical shock and vibration.

The solution:

A design in which a series of massive metal dynodes are compactly secured with ceramic rods for operation in a metal housing. The housing is rigidly mounted within a soft steel vacuum enclosure which shields the multiplier from the effects of electromagnetic fields external to the housing.

How it's done:

At the entrance of the vacuum enclosure, a shielding tube is maintained at the potential of the housing. Plates are mounted within the vacuum enclosure adjacent to the shielding tube to form an ion lens for focusing a beam of ions on the first dynode. Deflector electrodes are provided for directing the beam of ions either on the first dynode or onto a collector to be used to measure the gain of the electron multiplier. The dynode housing is kept at the high negative potential of the first dynode, which results in a strong focusing effect for secondary electrons. Losses of electrons

(continued overleaf)

in the direction of the dynodes axes are thus avoided and higher gains may be achieved. A grid between the last dynode and the electron collector reduces substantially any pick up of high voltage hum and noise by the collector. If this grid is positively charged, it can be used to reverse the polarity of the output current, thus providing a positive output which is required for most logarithmic amplifiers.

Notes:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland 20771
Reference: B67-10060

Patent status:

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)), to the GCA Corporation, Bedford, Massachusetts, 01730.

Source: G.C.A. Corporation
under contract to
Goddard Space Flight Center
(GSFC-546)